## Isometric Projection.

A CUBE is defined as one of the solid bodies, having six equal square sides, twelve boundary lines of equal length, eight corners, and six diagonal planes. The following is a simple mode of forming a cube within a given circle: Let *a* Fig. 1, Plate 15, be the given circle. Through the centre *a* draw a line or diameter *b a c*, dividing the circle into exactly equal and similar parts. Next divide the right-hand semicircle *c b d e* into three equal parts in the points *d* and *e*, and the left-hand semicircle *c g f b* similarly in the points *g* and *f*. Next join the points *g c*, *c d*, *d e*, *e b* *b f*, *f g*, and from the centre *a* draw lines to *g* and *d*; *g c*, *d e*, *b f* is the cube required. Fig. 2 shows the cube shaded.

But while this is a ready mode of delineating a cube within any given circle, it must be remembered that this does not enable an exactly correct isometrical projection of a cube of which the side is given. Thus: suppose the line *a b*, Fig. 2, to represent the length of one of the sides of a cube, of which it was desired to have an isometrical projection; if this projection was made, as say Fig. 1, the length of the corresponding side, *g c*, Fig. 1, would not be the same as *a b*, but less. A line, therefore, when projected isometrically, is less than the line from which it is projected, and this is in proportion of 9 to 11; a line, then, 11 inches long, when projected isometrically, will be only 9 inches long. A method is therefore required by which we can project or draw a cube isometrically of which the cube is given. This is done below. Let *a b*, Fig. 3, be the length of one of the boundary lines of a cube of which *a b c d* is the side. Draw the diagonals *a b c d*, and from *b* a line *b e*, cutting the diagonal *c a*, so as to make the angle *d b e* equal to 30°. Then from any point, as *a*, Fig. 4, with radius equal to the distance *b e*, Fig. 3, describe a circle, and divide this with the same distance into six equal parts in the points *c d e f* and *g*, which being joined as in Fig. 1, will form a cube of which the side *g f* will be an isometrical projection of *a b*, Fig. 3. To form the angle *d b e* of 30°, let *a c b d*, Fig. 5, be the diagonals of the square *a b c d*, Fig. 3, then from point *a*, corresponding to point *b*, Fig. 3, with a radius of 60°, taken from a scale of chords, describe the arc *e f*; then from the same scale of chords take the distance 30°, and set this off from the point *e* to the point *f*; from *a* draw *a f*; *b a f* is an angle of 30°.

An isometrical line being as above stated in proportion of 9 to 11 to a line of which it is the projection, an isometrical scale may be made by which a series of cubes may be projected in correct isometrical perspective. This scale may be made by drawing two lines, *a b*, *b c*, Fig. 6, at right angles, making *b c* nine elevenths of the line *a b*, and joining *c a*. Then make the line *a b* to represent an ordinary scale, say of eighths of an inch or inches, and suppose the point *d* to represent the portion of the sixth inch, draw *d e* parallel to *a c*, cutting *b c* in *e*. Then the distance *b e*, taken in the compasses, will be the isometrical projection of a line, say 6 inches long, of which the correct scale is given in the line *a b*. The use of this scale in projecting circles will be fully described hereafter.

As before defined, a cube is a solid body having six sides, of which all the sides are equal; in the isometrical projection of a cube, as in Fig. 2, three of these sides are shown; of these three we designate the side *c* the upper side, *d* the "left hand," and *e* the "right hand" sides. Now by cutting these sides by lines parallel to them the representation of right-lined and rectangular objects will be obtained with great facility.

Fig. 8 represents the method of making a "scale of tangents," useful in cutting isometrical planes at any angle.

The remaining figures will be explained in another paper.

*(To be continued.)*

## Intercommunication.

THIS department is intended to furnish, for the benefit of all our readers, practical information regarding the art of manipulating wood by hand or machinery; and we trust that every reader of our paper will make the fullest use of it, both in asking and answering. All persons possessing additional or more correct information than that which is given relating to the queries published, are cordially invited to forward it to us for publication. All questions will be numbered, and in replying it will be absolutely necessary, in order to secure due insertion, that the NUMBER and TITLE of the question answered should be given; and in sending questions, the title of key-words of the question should be placed at the head of the paper. Correspondents should in all cases send their addresses, not necessarily for publication, but for future reference. We also request that all questions or answers be written on separate slips of paper, and addressed to the Editor. Notes of practical interest will be welcome at all times. When drawings are sent to illustrate answers to questions, or for full pages, they should be on separate slips, and should be drawn in ink on clean, white paper. Short questions, requiring short answers, may be asked and answered through the agency of postal cards.

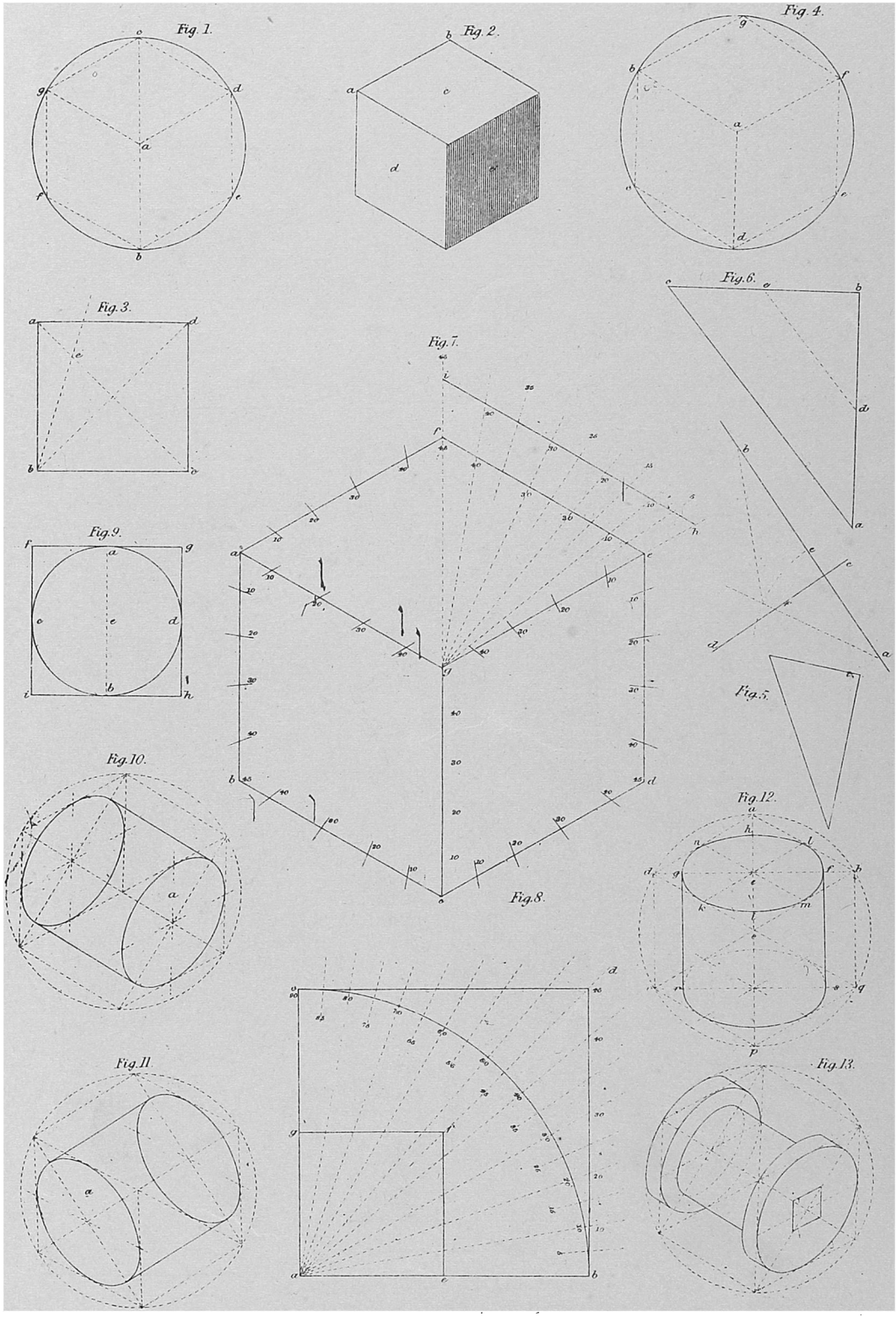
When answers to questions are wanted by mail, the querist must send a stamp for return postage.

### Queries.

6. SCREW-DRIVER.—Can any of your readers tell me the reason why a screw-driver with a long blade will drive a screw with greater ease than one with a shorter blade?—GAD.

7. MITRE.—I would like to know whether there are many joiners that are able to cut a true mitre "by the eye," without the aid of a mitre-box or templet? I have frequently cut mouldings, stops, and other work that required mitring without a box or templet, and the joints have been as true as if cut in a box.

PLATE 15.

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